been proposed for the 9th Plan period from various non-conventional energy sources such as wind, small hydro, biomass and solar energy. An investment of about Rs. 14,000 crore will be required for the establishment of this capacity. The Ninth Plan physical and financial targets are yet to be finalised.

New Technology for Wind Generators

540. SHRI VEDPRAKASH P. GOYAL: Will the Minister of NON-CONVENTIONAL ENERGY SOURCES be pleased to state:

(a) whether Government are aware that the tripping of each of the five 210 MW units of the Tuticorin Thermal Power Station on 30th May, 1997 turned the spot light on the need for new technology for wind generators;

(b) if so, whether Government have made any study in this regard;

(c) what are the details of the study made alongwith results thereof;

(d) whether it is a fact that Government of India had a technical consultancy agreement with a European firm in the field of wind energy;

(e) the details of the projects installed on their advice and in pipelines; and

(f) the performance reports of the projects already completed with details?

THE MINISTER OF STATE OF THE MINISTRY OF NON-CONVENTIONAL ENERGY SOURCES (CAPT. JAI NARAYAN PRASAD NISHAD): (a) The tripping of the five units of the Tuticorin Thermal Power Station cannot alone be attributed to the operation of wind electric generators installed in the area. The Southern grid tripped on account of the overloading of the system and typical under frequency grid conditions. The wind electric generators which were already connected to the grid while generating active power continued to draw the reactive power required for their operation. The Tuticorin Thermal Power Station would have tripped in cascade since it could not supply the reactive power requirement of wind farms along with other loads connected to it, although it was augmented by power generated by the wind farms. With the introduction of power factor compensators, or variable speed operation for active and reactive power control, the reactive power requirement of wind electric generators can be minimised.

(b) and (c) An R&D project has been taken up for suitable modifications in wind electric generators using induction generators, which will enable the reactive power requirements of such machines to be minimised. Tamil Nadu Electricity Board have also taken up a Study by Anna University on remedial measures for excessive drawal of reactive power by such wind electric generators. The Study has not so far been completed. Meanwhile, several interim measures have taken to improve the power factor and minimise reactive power drawal from the grid.

(d) No, Sir.

(e) Does not arise.

(f) An aggregate wind power capacity of about 900 MW has been installed in the country. Over 2 billion units have so far been fed to the grid from these projects. By and large, the performance of the wind power projects has been found to be satisfactory.

Setting up Asia's Largest Solar Plant Project at Kalyanpur

541. SHRI SUSHIL KUMAR SAMBHAJIRAO SHINDE: SHRIMATI VEENA VERMA:

Will the Minister of NON-CONVENTIONAL ENERGY SOURCES be pleased to state:

(a) whether wind and solar energy is projected to be harnessed with a view to substantially diversify and conserve the conventional energy resources;

(b) whether efforts in this directions during Eighth Five Year Plan have failed to cut much ice, if so, the extent to which wind and solar power have been harnessed to generate electricity so far and the targets fixed in this regard for the Ninth Five Year Plan; and

(c) whether it is a fact that Asia's largest solar plant project proposed to be set up at Kalyanpur (near Aligarh) has flopped, if so, in what circumstances and at what stage?

THE MINISTER OF STATE OF THE MINISTRY OF NON-CONVENTIONAL ENERGY SOURCES (CAPT. JAI NARAYAN PRASAD NISHAD): (a) Yes, Sir.

(b) Significant progress was made during the Eighth Plan towards harnessing wind and solar energy. Against a target of 100 MW, about 860 MW of Wind Power capacity was commissioned during the Plan period. Against a target of 3 MW, Solar photovoltaic projects of 25 MW capacity were installed. This capacity primarily comprises stand-alone systems for lighting, pumping, telecommunication etc. and about 700 KW of grid-connectioned solar power projects.

The following targets for the Wind and Solar Energy Systems have been proposed for the 9th Five Year Plan:-

(i) Wind Power	2000 MW
(ii) Solar Photovoltaic systems	100 MW
(iii) Solar Power Projects (Grid-connected)	150 MW

(c) No, Sir. The 100 KW solar photovoltaic power plant is providing domestic lighting to 475 households, electricity for 65 street lights and 15 irrigation pump sets in Kalyanpur village. Barring a few problems, the 75 KW stand-along portion of the Plant has by and large been functioning satisfactorily. The 25 KW grid-connected portion is under trials. Very useful experience has been gained from this plant in manufacture, installation and operation of high voltage solar photovoltaic systems.

Production and Demand of Power in Punjab

542. SHRI MOHINDER SINGH KALYAN: Will the Minister of POWER be please to state:

(a) the estimated annual production and demand of power in the State of Punjab during 1995-96 to 2000 AD:

(b) the estimated increase in the shortage of power supply in the State during the aforesaid years: and

(c) the steps being taken by Government in this regard?

THE MINISTER OF STATE OF THE MINISTRY OF SCIENCE AND TECHNOLOGY AND MINISTER OF STATE OF THE MINISTRY OF POWER (SHRI YOGINDER K. ALAGH): (a) and (b) Details of actual power requirement and availability for 1995-96 & 1996-97 and projected requirements for 1997 to 2000 A.D. are as follows:

	1995-96 (Actual)	1996-97 (Actual)	1997-98 (Projected)	1998-99 (Projected)	1999-2000 (Projected)
Energy Requirments(MUs)	20368	21770	25439	26937	28551
Energy Availability (MUs)	19981	21414	—	—	—
Peak Demand(MW)	4000	4020	4695	4952	5228
Peak Met (MW)	3840	3695	—	—	—
Gap (MW)	160	325	—	—	—